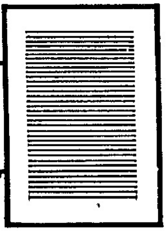
THE NEW WORLD OF MAG CARD II



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The IBM Mag Card II is a most versatile piece of automatic typing equipment that can multiply office productivity if used imaginatively. However, it is important that someone in the office understands how it works and what it can be made to do.

TECHNOLOGY

The Mag Card II (hereafter "Mag II") is a radical departure from IBM's MT/ST tape machine, and even from its Mag Card "Selectric" ("Mag I"). The Mag II uses memory, a technology entirely different from what the two predecessor pieces of equipment employ. This new technology is contained in the internal part of the machine, and, consequently, looking at a Mag II will offer almost no insight into how it works.

In the MT/ST, typing is initially recorded onto a magnetic tape. See Allen, *Law-Office Typing with the IBM MT/ST,* THE PRACTICAL LAWYER, April 1970, p. 13. In the Mag Card "Selectric," typing is initially recorded onto a magnetic card. See Sternin, *Magnetic Cards—A New Medium for Automatic Typing,* THE PRACTICAL LAWYER, Oct. 1970, p. 49. But in the Mag II, typing activates a memory, or "buffer," as it is technically known—a group of electronic circuits that can receive and hold 8,000 characters or about two pages of typing. Magnetic cards are used by the Mag II, but only to store materials after they have been formulated or reformulated in memory.

Since the machine memory consists of circuit boards and chips that hold the text as electrical signals, the text can be manipulated automatically and rapidly and various points within memory can be accessed almost instantaneously.

How Memory Operates

For example, going forward two paragraphs or back a line can be accomplished in memory instantaneously by pressing appropriate keys. Nothing physically moves; instead, circuits are searched electronically for codes. If new characters, words, or lines are added at any point within the text in memory, all the text that follows is pushed ahead to make room. Nothing is covered or erased; circuits simply manipulate electronic signals. To delete material, pressing appropriate keys eliminates characters, words, or lines instantaneously, and the text that follows moves back electronically to close the gap.

The equipment will arrange the words in memory into lines. As a standard procedure, text in memory is assembled into lines of about six inches long, or of a different length if the operator sets a different margin, as the machine manipulates electronic signals in memory. If any long words will fall beyond the margin, the equipment will stop automatically and wait for the operator to keyboard a hyphen. The operator may also elect to set the right margin in a special way and eliminate any stops for hyphenation, a helpful feature to use during drafting, when the right margin may be overrun.

Furthermore, the Mag II will arrange the lines in memory into pages. The operator enters a line count to establish how many lines will make a page, and the equipment will automatically stop when it has counted out that many. When pages have been formulated, the operator may save them by transferring them to magnetic cards, each page on its own card.

Magnetic Cards

The Mag II and the Mag I use the same magnetic cards, and cards recorded on either machine can be played out on the other. However, in the Mag II the magnetic cards have a more limited function—they simply store the text. Text that has been finalized in memory is recorded onto cards, and material on cards is returned into memory.

Mag cards are recorded and read back into memory at a card console, a separate unit about a foot wide that stands alongside the typewriter and is connected to it by a cable. The card console of the Mag II has two input slots—one, a single card slot that handles cards one at a time, and the other, a pack feed slot that handles up to 50 cards. Both slots may be used separately or together, either when recording text from memory onto cards or when reading text from cards back into memory.

FINALIZATION

The Mag. II is basically a page generating machine. It is designed to assemble and finalize pages in memory and then to store them on matching mag cards, one page to a card. Of course, a "page" need not be an 8½ by 11 inch sheet of paper. It can be the contents of a sheet of stationery, a paragraph, or any portion of text treated as a unit.

Pages can be finalized in memory either during or prior to the typing out of memory's contents. The operator chooses the method deemed best for the job at hand.

During Playout

The operator may have the machine begin typing onto a proposed final sheet of paper, rather than onto scrap paper, and visually follow along by watching the paper while the copy is being typed. When a point of change is reached, either the machine is stopped or it may have been pre-coded when the recording was initially made to stop automatically at that point. If an insertion is needed, it is keyboarded onto the paper and it simultaneously goes into memory, and the text in memory that follows is automatically pushed ahead to make room. If the change calls for a deletion, the appropriate keys are depressed and characters, words, or lines are eliminated from memory, and therefore will not appear on the paper when the machine is restarted.

As the right margin is reached, the machine automatically adjusts line-ending points between words, both on the paper and in memory. If long words are reached at the right margin, the machine stops so that the operator may play out the word letter by letter to a hyphenation point. If a line count has been entered to establish the number of lines that will constitute a page, the machine will stop automatically when that number of lines have been typed. The operator can record the lines onto a magnetic card, and store card and page together.

Prior to Playout

The operator may choose to have the machine finalize a page in memory prior to playing it out onto final paper. Then the operator works with a piece of scrap paper in the machine's roller, or platin. Points of change are accessed in memory electronically by depressing the appropriate keys to advance by paragraph and line. Nothing is typed. Hence the head of a line is accessed almost instantaneously. The point of change within the line is reached by playing out the line word by word. This material is typed by the machine onto the scrap paper, and in that way the operator sees where she is.

If text has to be added at the point of change, the operator types it on the keyboard and thus enters it onto the scrap sheet in the roller and also into memory. Any typed errors are eliminated by backspacing over them. The text in memory that follows the point of insertion is pushed ahead electronically. If text has to be deleted at the point of change, the operator presses character, word, or line delete keys and the text that follows is moved back electronically to close the gap. By this approach, all points of change are accessed in memory and modifications made. The only text that appears on the scrap sheet are the lines on which changes had to be made, and, on those, only from the beginning of the line to the point of change.

Scanning

After all points of change are accessed and corrections made, prior to any type out, the words are formulated, again in memory, into lines and the lines into pages. This process is called "scanning." Scanning is started by depressing a "scan" key; the equipment formulates the text in memory into lines approximately six inches long, or into longer or shorter lengths, if the margin was set for a longer or shorter line length. The only text in memory typed onto the scrap sheet during this scanning process are long words found in memory at and over the right margin and hence requiring hyphenation. These words are typed onto the scrap sheet, together with the number of the line on which they appear, with a space within the word indicating exactly where it goes over the margin, and a dash, if it happens to be the last word of a paragraph. (Some people object to the last half of a word being on a line by itself, and they will not hyphenate the last word of a paragraph.) The operator is thus able to insert a hyphen at an appropriate point, or elect to leave the entire word at the end of the line or move it to the next.

Similarly, the lines are formed into pages in memory during this scanning process. The Mag II counts the number of lines being formulated. When it reaches the number of lines that have been entered as the line count, it types out the proposed final line onto the scrap sheet, together with the line count number. The operator may then accept that line as the final one of the page, or add a line and end the page with the next line, or line return and end the page with the prior line.

If the line count is reached but one more line will end a full paragraph, the equipment will automatically scan through that additional line and type it as the proposed final line. If the line count would be reached at the first line of the next paragraph, the Mag II stops one line short of line count and types the closing line of the prior paragraph as the proposed final line. If the equipment formulates all the text in memory into lines but has not reached the line count entered, it types out a number which indicates how many lines it is holding in memory and the operator may then add more text or end the page at that point.

Each of these stopping points gives the operator the option of accepting the material formulated up to that point as a page or of making some modification by retracing a line or going ahead and transferring the page thus formulated to a magnetic card.

ADVANTAGES

By now, it should be obvious that the machine is extremely sophisticated, capable of some entirely novel ways of getting words onto paper. The approaches that the Mag II makes possible will have far reaching implications not only on the quantity of work which an office will be able to produce but also on the methods by which it will be produced.

Time Saving

The one capacity that underpins the potential of this equipment is the ability to pre-finalize a page in memory. An operator can add, delete, and supplement electronically, and the machine will move the text that follows forward or back, as necessary. It will arrange the finalized text into lines and lines into pages. Consequently, a complete page in memory can be finalized in a fraction of the time it would have taken to have finalized the page during a typeout of its contents.

The most immediate advantage of this pre-finalization technique is that once a page is finalized in memory it can be run from beginning to end without the operator having to follow along, and she is free to give her attention to other aspects of her work.

Unskilled Operators

Pre-finalization capacity may also lead to the utilization of a secondary group of operators whose job it will be to run off in final form the magnetic cards that the primary staff has formulated. A secretary who knows how to use the Mag II can pre-finalize a page of text and record it onto a card in much less time than it would have taken the equipment to type it. Once finalized, another person can play it out.

This secondary operator need only know how to insert paper into the machine's roller and cards into its slot. Staff could come after the close of regular business hours just to run off pre-finalized materials, or present staff could play out the magnetic cards while attending to other duties. The finalized cards can be played out on a Mag II machine, a Mag Card "Selectric," or a Mag/A machine.

Unattended Playout

Another direction in which pre-finalization will take some offices is toward unattended playout. The Mag II has the capacity to return cards into memory automatically in succession. By using the equipment with continuous form paper —fan-folded sheets that are connected by perforations at the top and bottom—many pre-finalized materials can be run off without operator involvement.

PRACTICAL USES

To relate the Mag II to everyday practice, consider it at work in three different areas:

- As a keyboarding device, to do initial manual typing;
- As a revisionary tool, to make changes in a drafted document; and
- For the production of documents by employing pre-recorded or stored units of text.

Initial Typing

Keyboarding words onto paper in the first instance is the slowest part of typing. The Mag II has a number of helpful features to expedite that chore.

Removing Errors

The May II is equipped with an error correction tape that lifts or blots up erroneously struck characters from the paper, thus allowing many typing jobs to be done in acceptable final form the first time. This tape is activated by backspacing. Of course, the erroneously struck characters remain visible on any carbon copies. However, in the case of letters, carbon copies usually do not leave the office anyway. For documents whose originals are photocopied to produce duplicates, the error correction feature is ideal.

The error correction feature is linked to the machine's memory. If an operator backspaces repeatedly in succession, the equipment simply goes backwards in its memory and the erroneous characters are deleted from memory the same time they are lifted from the paper.

Centering

The Mag II will automatically center lines of typing. When a centering key is pressed, the words typed thereafter are not placed onto the sheet of paper in the machine's roller but are stored in memory. When the typist finishes the line, the equipment centers it automatically in memory, and the line as centered is then typed onto the sheet of paper. Thus, a secretary can correctly center lines directly into final copy during its initial typing, rather than having to do the line onto scrap paper first.

Locating Decimal Points

Similarly, the Mag II will automatically locate the numerals in a number, so that its decimal point will be typed at a given tabular stop, regardless of how many figures come before or after the decimal point. When a decimal tab key is pressed, the figures typed thereafter are held in memory. After the entire figure is typed, the equipment will type it onto the paper, but only after having automatically moved it forward enough so that the decimal point comes at the proper tabular point.

Making Corrections

The Mag II is also extremely helpful in keyboarding work being typed in draft. Some typists type all their work first onto scrap paper and then in final form. Others customarily start on good paper, expecting to prepare a final draft, but if a major mistake occurs, they then consider the item an initial draft, and re-type it. Either way, the memory of the Mag II enables the typist to correct errors and make changes.

By depressing the appropriate key, the typist can find the beginning of the page in memory and then advance to the beginning of a particular paragraph or line. Any point within a line is reached by playing out the typed material from the beginning of the line to the word or character involved in the change. Additions made to the text at that point simply push the following text ahead in memory. If there are deletions, the text that follows the deletion is automatically moved back to close the gap. The equipment will rearrange the line-ending points automatically, either prior to or while playing out the text onto paper.

The memory capacity of the Mag II is involved even during initial keyboarding. It allows work to be sent out as initially typed which, without memory and the capabilities which it supports, would have required the work to be re-run.

Revisionary Work

Revision involves changing typed materials. The Mag II is exceptionally well suited for that purpose. During initial keyboarding, each typed page is recorded onto a matching magnetic card. Consequently there is a one-to-one correspondence between pages and cards.

Revision is begun by taking the magnetic cards with text on them that has to be changed and transferring the text back into memory. That process is accomplished electronically at high speed. The draftsman will usually have indicated the changes wanted by careting and interlineating material to be added and by striking out material to be deleted. The Mag II operator simply parallels what the author has done.

She accesses the point in memory where an addition is required by depressing the paragraph advance key an appropriate number of times, to move to the beginning of the paragraph that contains the change; depressing the line advance key an appropriate number of times to move to the beginning of the line that contains the change; and playing out the recorded words, one by one, to the point of change. The author's careted and interlineated material is now added into memory by typing it. Everything that follows is pushed over.

The same accessing procedure is used to reach points of deletion. The words the author has stricken are deleted from memory by pressing word, line, or character delete keys. Everything that follows moves back.

When revision of the text has been completed, the equipment rearranges it into lines of whatever length the operator selects, either prior to playout, or as the text is being typed out onto paper, and will count the lines to make a page of whatever length the operator wants.

The card console of the Mag II is expressly designed to expedite handling cards during revision. Cards that need revision may be inserted one at a time, or, if a document is several pages long and recorded on a series of consecutive cards, the console can process these cards one after another through the pack feed slot. The content of the first card is taken into memory and that card retained internally in the console. When the revision has been completed in memory, the revised material is transferred back onto that card, and it is dropped into a stacker. The next card, containing the text of the second page, is then taken into memory, and the process is repeated. In that way, all pages are revised onto matching cards, and the card to page relationship is maintained.

Overlapping Pages

The memory of the Mag II can hold about two pages of text, thus permitting the overlap of one page and the next. When an operator adds to a page in memory, memory's content may be increased to more lines than will fit one sheet of paper. The two page capacity of the Mag II memory will accommodate the excess. When enough lines of text to fill a page are finalized and recorded onto a card, the beginning of the next page often remains in memory. The content of the card containing the next page, when read into memory, will then be added to the text that has remained in memory.

Thus, in revisionary work, the Mag II's memory can be utilized to pre-finalize and to rearrange text into lines and lines into pages without typing anything other than the newly added words.

Pre-Recorded Work

The use of automatic typing equipment to produce pre-recorded materials, sometimes called "programs" or "systems," has been increasing. See Sternin, *Programmed Approaches to Office Paperwork,* THE PRACTICAL LAWYER, June 1975, p. 55.

Advantages over Printed Forms

It is important to distinguish pre-recorded applications from the use of printed forms, with which they are sometimes erroneously equated. The tremendous potential of pre-recorded materials lies in their capacity to be utilized not simply as recorded, but in some changed way. It is possible to place stop codes in the recorded material and provide for the entry of variable information, such as names, ages, dates, and locations. The length of these entries may vary without limit: the Mag II will readjust automatically the line endings in the material that follows. It is feasible to pre-record alternative words, phrases, even sentences and paragraphs, for inclusion or omission on each particular use of the pre-recorded item. It is also possible to adapt pre-recorded materials to a particular one-time need simply by employing the various modification techniques previously described.

Moreover, unlimited flexibility is attainable simply by storing separate paragraphs on individual cards and combining them in whatever sequence they are needed. This potential could never be achieved by the use of printed forms. Often, these language components are combined with pre-recorded names and addresses, pre-recorded captions, or pre-recorded data of other sorts, to produce a vast number of typing jobs that are substantially machine generated.

Page-Oriented Matter

The capacity of the Mag II to be used in pre-recorded applications is exceptionally far reaching. As mentioned earlier, the Mag II has two input slots: the single card slot, which accepts cards individually, and the pack feed slot, which accepts, one by one, up to 50 cards from a stack. In most pre-recorded applications, both slots are used.

Pre-recorded documents, which include stored letters and multi-paragraph subsections of certain longer instruments, like the derivative causes of action in complaints or the subscription language at the close of a will—page-oriented materials, as distinguished from paragraph-oriented ones—may be reproduced very easily on the Mag II.

In most instances, the magnetic card containing the pre-recorded material will be read into memory through the single card slot and returned to its storage device immediately. If the document is stored on more than one card, the cards are read into memory through the single card slot one at a time, and each page of the document is separately composed. As each page is finalized in memory, it is recorded onto a mag card. The two page capacity of memory enables the operator to read in the next pre-recorded card and add its contents to any balance of the preceding page that has remained in memory.

After the material is read into memory, the operator may pre-access the points of change and pre-finalize a page of text in memory, and then play it out and record it on a magnetic card. On the other hand, she may elect to have the equipment type the page directly onto final paper in proposed final form and follow the typing action along visually, making any needed modifications or supplementation as each point of change is reached. Since line endings will be automatically rearranged during playout, when the last word is typed, the text in memory will have been automatically fully rearranged and will match the typed copy. The formulated page of text may be saved by recording it on a blank mag card taken from the pack feed slot.

In some more specialized applications, mag cards containing pre-formulated materials, rather than being inserted individually through the single card slot, may be placed into the pack feed slot as a group. Thus they may be read into memory and played out one after another. Generally, these are instances in which a set of cards has been fully pre-formulated at some earlier point, or applications that are parts of programs of work in which all the cards are always kept and used in the same sequence and put away together when they are finished.

Paragraph-Oriented Materials

Paragraph-oriented materials that are employed to put together documents using the separately recorded paragraphs can be handled the same way as full documents are.

Each individual pre-recorded paragraph is read into memory by inserting the card that contains it into the single card slot. The card is copied into memory, ejected, and returned to its housing device immediately. The duplicated copy in memory may be revised or supplemented, either by pre-accessing the points of change first, or by following along during playout and making the changes as each point of change is reached.

An operator who chooses to pre-access the points of change in memory will usually find it faster to record each paragraph onto a blank mag card as soon as it has been finalized in memory, then read in the next pre-recorded card and finalize and record it. In that way, she will be working in memory with only one paragraph at a time, and not with the composite of all the paragraphs that have preceded it. At the end, there will be a stack of finalized paragraph cards in sequence, which can be placed into the pack feed slot and read into memory one after the other to form the composite document. This composite can then be typed and stored on more magnetic cards, one page per card.

As an alternative, the Mag II can type the paragraphs directly onto final paper. Each pre-recorded card is copied into memory through the single card slot and returned to its housing device. The duplicated text in memory is played out onto final paper, with supplementation and modification at the points required. The process is repeated with the next paragraph card. When the page in the machine is fully typed, its matching text in memory is recorded onto a blank mag card taken from the pack feed slot. Memory is now empty, and the next page may be formulated in the same way.

Split Memory

The memory of the Mag II may be divided and the materials recorded in each section merged together. The alternate sections need not be of equal length. Materials may be drawn alternatively from one section or the other by depressing an appropriate key and thereby "addressing" the section containing the material wanted. The recorded material may also be coded with switch codes—codes that will stop the typing action in the section of memory being played out and automatically start the typing action in the other section.

The end product will be a typed document whose parts have been drawn alternately from the two parts of memory. However, the Mag II cannot produce a matching mag card recording of the composite. Hence, this approach should be utilized only if all that is wanted is a final typed document, with no matching recording.

The capacity to merge materials taken from two memory sources is valuable in many of the more advanced, fully automatic applications. An imaginative operator should find many uses for split memory, even without switch codes. Thus, it is often convenient to have some frequently employed item stored in one part of memory, so that it can be played out whenever needed simply by depressing a key which addresses that section of memory.

Unattended Playout

The Mag II has the capacity to type by itself, using continuous form paper. Eventually, many offices will take advantage of this feature, not so much to save the salary of an operator, but because the work output is enormous. The machine just keeps going, page after page.

The Mag II not only is capable of counting lines, it also can add whatever number of additional carrier returns are necessary to reach a given number of lines. Like all standard typewriters, it types six lines to the vertical inch. If the continuous form paper is 11 inches long, the line count can be 11 times 6, or 66. In an unattended operation, the Mag II will count the number of times the carrier has returned during typing, and automatically add in the balance to reach 66. Consequently, the next item will be started at the same equivalent point on the continuous paper as the preceding one.

This supplementation of the line count is automatically repeated at the end of each item typed, and consequently, items of differing lengths can be intermixed. Each will be started at the same equivalent point on the continuous form paper.

The equipment has the further capacity to clear memory automatically at appropriate points, and thereupon to read in the next card from the pack feed slot. With these features combined, continuous, unattended operation is possible for the Mag II.

Furthermore, as memory can be divided into two sections, each calling out material from the othe upon reaching a switch code, material may be stored in one part o memory in a way that it will be repeated each time it is called fo by the other. Consequently, a constant message, such as the full body of a standard letter, may be played out over and over again, under the control of a chain of names and addresses passing through memory Fifty cards, each containing 5 names and addresses, could lead to the typing of some 2,500 individua letters, each fully addressed, without operator involvement.

CONCLUSION

The Mag II is significantly different from the earlier automati typing equipment offered by IBM It may gyrate the office environment into a new era.